

RBC US Group Holdings LLC

2018 Mid-Cycle
Dodd Frank Act Stress Test
Disclosure

Internal Severely Adverse Scenario

October 2018



Forward-Looking Statements

The 2018 Dodd-Frank Act Mid-Cycle Stress Test Results Disclosure (the “Stress Test Results”) presented herein contains forward-looking projections that represent estimates based on the hypothetical, severely adverse economic and market scenarios and assumptions under the Internal Severely Adverse scenario as defined by RBC US Group Holdings LLC (RIHC). The quantitative outputs and qualitative discussion herein should not be viewed as forecasts of expected outcomes or capital ratios or as a measure of the solvency or actual financial performance or condition of RIHC. Instead, the outputs and discussions are estimates from forward-looking exercises that consider possible outcomes based on hypothetical, highly adverse economic scenarios. In addition, the Stress Test Results are impacted by certain risk factors, many of which are beyond our control and the effects of which can be difficult to predict, including credit risk, market risk, liquidity and funding risk, operational risk, regulatory compliance risk, strategic/competitive risk and legal and regulatory environment risk as discussed in this disclosure.

The outputs of the analyses and the discussion contained herein may not align with those produced by other financial institutions conducting similar exercises, even if similar hypothetical stress scenarios were used, due to differences in methodologies and assumptions used to produce those outputs. In addition, the results contained herein may not be comparable to results of prior stress tests conducted by RIHC, the Federal Reserve or other financial institutions due to the evolving regulatory framework, evolving macro economic and market environment and other factors.

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Overview of RBC US Group Holdings LLC

- RBC US Group Holdings LLC (RIHC) is an intermediate holding company (IHC) with total assets of approximately U.S. \$119 billion as of June 30, 2018. It is a wholly-owned subsidiary of Royal Bank of Canada (RBC).
- RIHC engages in capital markets, wealth management and personal and commercial banking activities, which are primarily conducted through four legal entities. U.S. capital market activities are conducted through RBC Capital Markets, LLC (CM LLC), while the personal and commercial banking activities are conducted through its subsidiary banks, City National Bank (CNB) and RBC Bank (Georgia), National Association (RBC Bank). Wealth management activities are primarily conducted through CM LLC, City National Bank (CNB), and RBC Global Asset Management (U.S.) Inc. (GAM-U.S.).
 - CM LLC is a registered securities broker-dealer which engages in capital markets origination transactions, private placements, collateralized financings, securities borrowing and lending transactions, and domestic and foreign debt and equities securities transactions. CM LLC is also a registered investment advisor. The wealth management business in CM LLC serves institutions and high net worth individuals with a wide-ranging group of investment, trust banking, credit, and other asset management products and services.
 - CNB provides a complete suite of banking, trust, and investment services to high net worth individuals and commercial clients in major metropolitan areas that have high concentrations of strategically targeted clients (e.g. Southern California, San Francisco, New York).
 - RBC Bank provides retail banking products and services to Canadian cross-border retail clients and small businesses. The entity provides a unique direct-banking experience, allowing clients to transfer funds, exchange currencies, and manage accounts through integrated online and telephone banking channels.
 - GAM-U.S. offers various equity, fixed income, cash management, and emerging markets / global equity and fixed income strategies to institutional investors in separate accounts, RBC mutual funds, and other private funds.

Overview of Mid-Cycle Dodd-Frank Act Stress Test

- The 2018 Mid-Cycle Stress Test Disclosure presents results of the Mid-Cycle stress test conducted by RIHC in accordance with the Dodd-Frank Act Stress Test ("DFAST") requirements.
- The rule requires Covered Companies, like RIHC, to disclose publicly the results of their Mid-Cycle Company-Run Stress Test under the internally developed Severely Adverse scenario, which describes the hypothetical evolution of certain specific macroeconomic and market variables consistent with a severely adverse recession.
- The planning horizon begins with actual results as of June 30, 2018 and includes a nine quarter forecast beginning with the third quarter of 2018 and ending with the third quarter of 2020.
- RIHC is required to employ the following assumptions regarding its projected capital actions beginning with the second quarter of the nine quarter planning horizon:
 - Payment of common dividends equal to the quarterly average dollar amount of common stock dividends paid over the past four quarters (including the initial quarter of the planning horizon and prior 3 quarters);
 - Payments on any other instrument eligible for inclusion in the numerator of a regulatory capital ratio equal to the stated dividend, interest, or principal due on such instrument;
 - No redemption or repurchase of any capital instrument eligible for inclusion in the numerator of a regulatory capital ratio; and
 - No issuances of common stock or preferred stock, except for issuances related to expensed employee compensation or in connection with a planned merger or acquisition.
- The results of RIHC's stress test, under the Internal Severely Adverse scenario are disclosed in the section "Company-Run Dodd-Frank Stress Test Results – RBC US Group Holdings LLC".

Company-Run Dodd-Frank Stress Test Results – RBC US Group Holdings LLC (1 of 5)

Capital Ratios, Actual Q2 2018 and Projected Q3 2018 – Q3 2020 Under the Internal Severely Adverse Scenario

Regulatory Ratio	Actual Q2 2018	Projected Stressed Capital Ratios ¹		Regulatory Minimum
		Ending	Minimum	
Common Equity Tier 1 Capital Ratio	16.9%	12.6%	11.8%	4.5%
Tier 1 Risk-Based Capital Ratio	16.9%	12.6%	11.8%	6.0%
Total Risk-Based Capital Ratio	17.6%	13.5%	12.8%	8.0%
Tier 1 Leverage Ratio	9.9%	7.2%	7.2%	4.0%

Risk-Weighted Assets, Actual Q2 2018 and Projected Q3 2020 Under the Internal Severely Adverse Scenario

(Billions of U.S. Dollars)

Item	Actual Q2 2018	Projected Q3 2020
RWA ²	\$67.1	\$69.7

1. U.S. Basel III standardized approach is used to calculate risk-weighted assets (RWA) for credit risk and market risk in the calculations for Common Equity Tier 1, Tier 1, and Total Risk-based Capital ratios.
2. Actual and projected RWA are calculated based on U.S. Basel III standardized approach.

Company-Run Dodd-Frank Stress Test Results – RBC US Group Holdings LLC (2 of 5)

Projected Losses, Revenues, and Net Income before Taxes through Q3 2020 Under the Internal Severely Adverse Scenario

Item	9 Quarter Total (Billions of U.S. dollars)	Percentage of Average Assets ¹
Pre-Provision Net Revenue ²	\$0.1	0.0%
Other Revenue ³	-	
<i>Less</i>		
Provision for Loan Losses	1.6	
Realized Losses/Gains on Securities (AFS / HTM) ⁴	0.0	
Trading and Counterparty Losses ⁵	1.2	
Other Losses/Gains ⁶	0.5	
<i>Equals</i>		
Net Income before Taxes	(\$3.3)	(2.8%)
Memo Items		
<i>Other Effects on Capital</i>	Q2 2018	Q3 2020
AOCI Included in Capital ⁷	(0.0)	(0.0)

1. Average assets reflect the nine-quarter average of total assets.
2. Pre-provision net revenue includes losses from operational risk events.
3. Other revenue includes one-time income and (expense) items not included in pre-provision net revenue.
4. Represents available-for-sale (AFS) securities and held-to-maturity (HTM) securities.
5. Trading and counterparty losses include mark-to-market, trading issuer default losses, CVA losses, and losses arising from the counterparty default scenario component applied to derivatives, securities lending, and repurchase agreement activities.
6. Other losses/gains primarily include goodwill impairment losses.
7. RIHC is not an Advanced Approaches institution and, as afforded by the Final Capital Rule, elected to opt-out of including most unrealized gains (losses) reported as part of accumulated other comprehensive income (AOCI) in its calculation of regulatory capital from March 31, 2017 onwards.

Company-Run Dodd-Frank Stress Test Results – RBC US Group Holdings LLC (3 of 5)

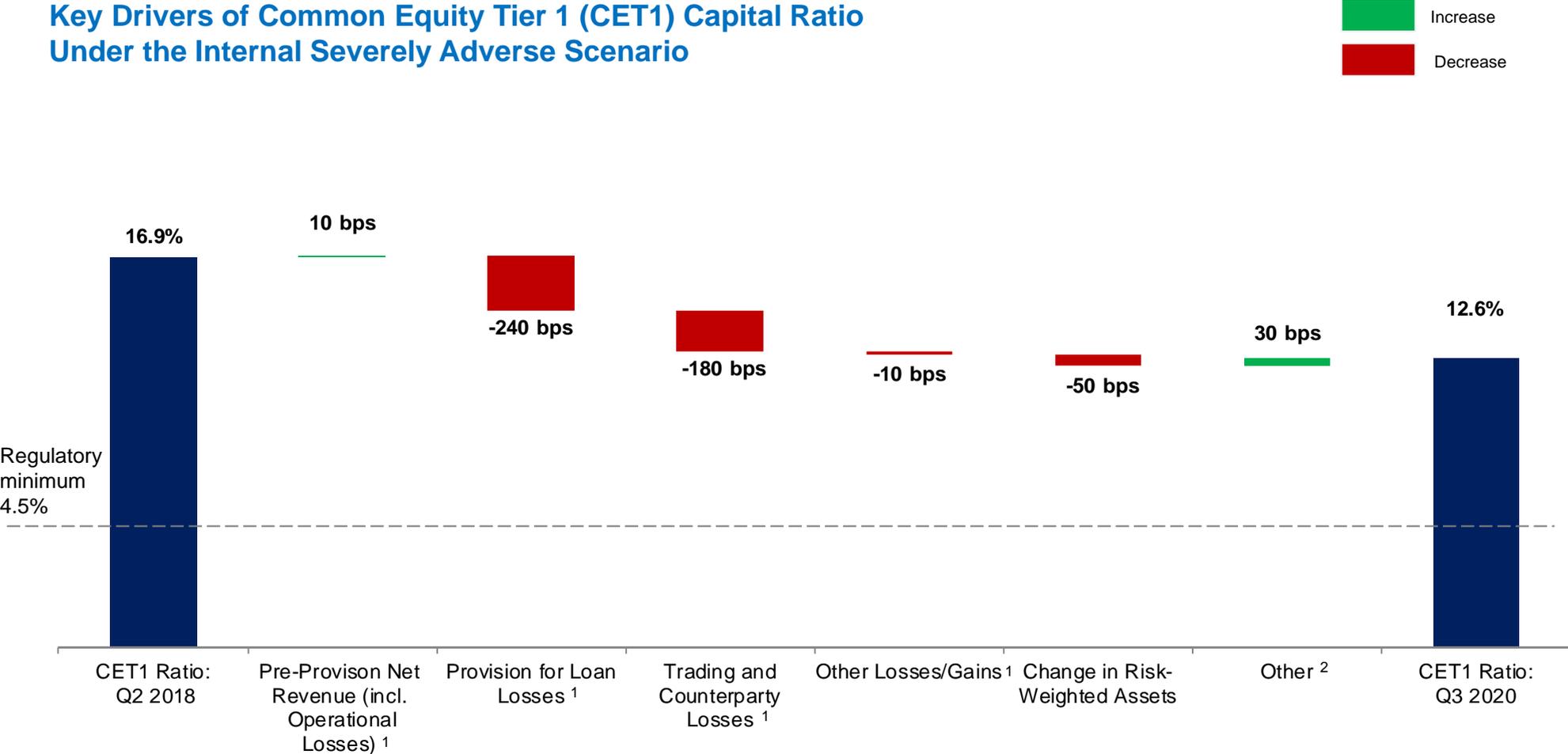
Projected Loan Losses, by Type of Loan, Q3 2018 – Q3 2020 Under the Internal Severely Adverse Scenario

Loan Type	9 Quarter Total (Billions of U.S. dollars)	Portfolio Loss Rates (%) ¹
First-Lien Mortgages, Domestic	\$0.1	0.5%
Junior Liens and HELOCs, Domestic	0.0	1.5%
Commercial and Industrial ²	0.4	4.5%
Commercial Real Estate, Domestic	0.5	4.3%
Credit Cards	0.0	8.8%
Other Consumer	0.1	7.1%
Other Loans ³	0.3	1.4%
Total Projected Loan Losses	\$1.3	2.5%

1. Portfolio loss rates represent cumulative portfolio losses as a percentage of the average loan portfolio balance over nine quarters. Average loan balances used to calculate portfolio loss rates exclude HFS loans and HFI loans under the fair-value option.
2. Commercial and industrial loans include small- and medium-enterprise loans and corporate cards.
3. Other loans include loans for purchasing or carrying securities (secured or unsecured) and loans to depositories and other financial institutions.

Company-Run Dodd-Frank Stress Test Results – RBC US Group Holdings LLC (4 of 5)

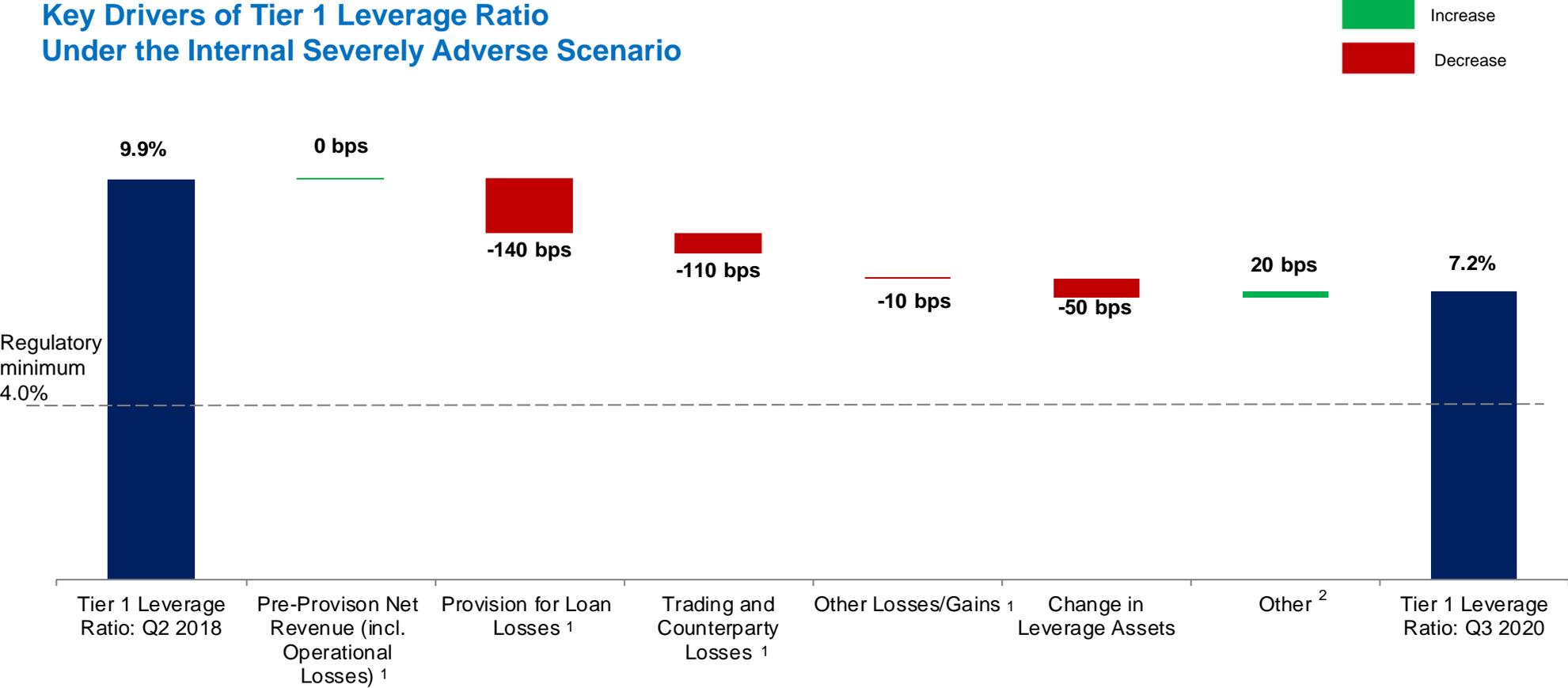
Key Drivers of Common Equity Tier 1 (CET1) Capital Ratio Under the Internal Severely Adverse Scenario



Note: Numbers may not sum due to rounding

- 1. Reflects pre-tax impact.
- 2. Other includes taxes including net operating losses, changes in CET1 deductions over the planning horizon, and realized gains/losses on AFS / HTM securities.

**Key Drivers of Tier 1 Leverage Ratio
Under the Internal Severely Adverse Scenario**



Note: Numbers may not sum due to rounding

- 1. Reflects pre-tax impact.
- 2. Other includes taxes including net operating losses, changes in CET1 deductions over the planning horizon, and realized gains/losses on AFS / HTM securities.

Key Risks Captured in Dodd-Frank Stress Test

The below risks are those inherent in RIHC's business activities and included in the Internal Severely Adverse scenario.

Risk Type	Description
Credit Risk	Credit risk is the risk of loss associated with an obligor's potential inability or unwillingness to fulfill its contractual obligations on a timely basis. Credit risk may arise directly from the risk of default of a primary obligor (e.g., issuer, debtor, counterparty, borrower or policyholder), or indirectly from a secondary obligor (e.g., guarantor or reinsurer). Credit risk includes counterparty credit risk from both trading and non-trading activities.
Market Risk	Market risk is defined to be the impact of market prices upon RIHC's financial condition. This includes potential gains or losses due to changes in market determined variables such as interest rates, credit spreads, equity prices, commodity prices, foreign exchange rates, and implied volatilities. This also includes the impact of market shocks with associated risks such as basis risk, illiquid market risk, and wrong way risk.
Liquidity and Funding Risk	Liquidity and funding risk is the risk that RIHC may be unable to generate sufficient cash or its equivalents in a timely and cost-effective manner to meet its commitments as they come due. Liquidity risk arises from mismatches in the timing and value of on-balance sheet and off-balance sheet cash flows.
Operational Risk	Operational risk is the risk of loss or harm resulting from people, inadequate or failed internal processes and systems or from external events. Examples include cyber risk, internal fraud risk, natural/man-made disaster risk, IT infrastructure risk, process & execution risk, model risk, and third party services disruption risk.
Regulatory Compliance Risk	Regulatory compliance risk is the risk of potential non-conformance with laws, rules, regulations, prudential standards, and prescribed practices in any jurisdiction in which RIHC operates.
Strategic/ Competitive Risk	Strategic risk is the risk that the enterprise or particular business areas will make inappropriate strategic choices, or will be unable to successfully implement selected strategies or related plans and decisions. Competitive risk is the risk of an inability to build or maintain sustainable competitive advantage in a given market or markets. These include but are not limited to acquisitions, divestitures and integration from a strategic view and products, services and pricing from a competitive view.
Legal and Regulatory Environment Risk	Legal and regulatory environment risk is the risk that new or modified laws and regulations, and the interpretation or application of those laws and regulations, will negatively impact the way in which RIHC operates. This includes litigation (actual and potential lawsuits filed) and legal & fiduciary risks (the risk that an agreement or arrangement, either establishing or modifying a legally binding relationship, does not reflect the business activities or commitments or fails to comply with applicable laws).

Forecast Methodologies – Internal Severely Adverse Scenario (1 of 3)

Overview

- The key RIHC forecasting approaches used to project financial performance and capital ratios include:
 - Quantitative Model approach: A quantitative model is a method, system, or approach that applies statistical, economic, financial, or mathematical theories, techniques, and assumptions to process input data into quantitative estimates.
 - Qualitative Methodology approach: A qualitative methodology is a forecasting approach that incorporates qualitative elements and business assumptions which may supplement or replace quantitative modeling. A qualitative approach may address new businesses, modeling limitations, and idiosyncratic portfolio risks that are not adequately represented in existing data.

Pre-Provision Net Revenue (PPNR)

- PPNR includes the estimation of the balance sheet, Net Interest Income, Non-interest Revenue and Non-interest Expense.
- Net Interest Income is composed primarily of interest income generated from portfolio loans, trading and securities assets and reverse repurchase agreements and is partially offset by interest expense driven by interest-bearing deposits, trading shorts, repurchase agreements and borrowings. The NII forecast is linked to macroeconomic variables through quantitative and qualitative methodologies.
- Non-Interest Revenue is earned through the execution of investment banking, sales & trading, wealth management services and other fee-related business activities, which are forecasted through a series of quantitative and qualitative methodologies using macroeconomic variables.
- Non-Interest Expense consists of variable and fixed costs, and includes compensation and non-compensation expenses which are linked to the business and revenue growth.

Operational Risk

- A combination of quantitative and qualitative approaches is used to estimate operational risk losses. These losses result from inadequate or failed internal controls, processes, people, systems or external events. For operational risk event types in which a sound statistical relationship exists, a quantitative regression model is used to estimate the operational risk loss, otherwise qualitative approaches are used.
- Scenario analysis is one of the main components used in the forecast. These scenarios align to the firm's material operational risks. Additionally, a loss component was developed to account for potential future legal exposure that is not present in the historical dataset.

Forecast Methodologies – Internal Severely Adverse Scenario (2 of 3)

Credit Risk

- Credit risk loss projections are based on the composition of wholesale and consumer loan portfolios across asset classes and customer segments. Projection strategy for loan portfolios is driven by product type and the underlying business model.
- Credit risk loss is projected predominantly using quantitative models, while a qualitative approach is used in a few instances. Quantitative models were developed for material portfolios. Several quantitative models are developed for different loan types to consider credit migration and transition in delinquency status, both of which are driven by underlying macroeconomic factors. Credit risk forecasts include projections of provision for credit losses (PCL), allowance for loans and lease losses (ALLL), non-performing loans (NPL), and net charge-offs (NCO).

Market Risk

- Market Risk stress testing includes:
 - A set of instantaneous shocks applied to the trading book and other fair value exposures.
 - Nine-quarter Other Comprehensive Income (OCI¹) and Other than temporary impairment (OTTI) projections applied to the AFS and HTM securities portfolio.

Trading Book and Fair Value exposures

- An instantaneous shock was applied in the first quarter. The shocks were comprised of a set of variables, such as interest rates and credit spreads. For most products, a full revaluation approach was applied by employing pricing models. For securitized products and equities a relative market value shock was applied.

AFS and HTM securities

- OCI¹ and OTTI were projected for the nine quarter internal stress scenarios. OCI was generated for AFS securities only and used the same pricing models employed for the trading book. OTTI was projected for both AFS and HTM securities.

¹³ (1) RIHC is not an Advanced Approaches institution and, as afforded by the Final Capital Rule, elected to opt-out of including most unrealized gains (losses) reported as part of accumulated other comprehensive income (AOCI) in its calculation of regulatory capital from March 31, 2017 onwards.

Forecast Methodologies – Internal Severely Adverse Scenario (3 of 3)

Counterparty Risk / Credit Valuation Adjustment Risk / Incremental Default Risk

- The counterparty default scenario involved estimating the potential losses associated with the instantaneous and unexpected default of a counterparty with zero recovery. The counterparty default loss was determined by applying the internal GMS scenario to determine the stressed exposure for each counterparty. Qualitative factors were applied to determine which counterparty defaults and the potential contagion impacts.
- CVA is an adjustment to the mark-to-market valuation of trading derivatives that accounts for the risk of adverse changes in counterparty credit quality. CVA losses were estimated primarily through a Monte Carlo simulation approach.
- The trading IDR model estimated losses associated with the issuer defaults of securitized products and other credit sensitive products held in the trading portfolio. Loss projections are based on probability of default (PD) and loss given default (LGD) models via a Monte Carlo simulation.

Capital

- RIHC's capital position is projected on a quarterly basis based on capital impacts of the revenue and loss estimates as described above.

Credit RWA

- Credit RWA calculation adheres to the US Basel III standardized RWA methodology. RWA projection is based on projected movements in on-balance sheet and off-balance sheet exposures, and risk weightings.

Market RWA

- The Market RWA projection methodology is consistent with the methodology employed for spot market RWA calculations: general market risk (Value at Risk and Stressed Value at Risk), specific risk, and de minimis exposures.
- VaR and SVaR projections represent the general market risk components. Specific risk captures credit default and rating migration risk. Projected RWAs reflect the impact of the macroeconomic environment; for example, changes in volatilities and credit spreads were incorporated into our calculation of projected RWAs.

Description of Mid-Cycle Stress Test Internal Severely Adverse Scenario

The Firm's internally developed Severely Adverse stress scenario is characterized by a sharp decline in GDP led by ongoing trade disputes with major US trading partners and collapsing business confidence. Foreign purchases of US Treasury securities decline as a result, pushing long term rates higher. The economy begins to recover going into the end of the stress horizon.

GDP declines by -7.5% with growth remaining weak throughout much of the stress horizon. The unemployment rate increases by 6.2 percentage points; headline inflation trends lower in the face of a weakening economy.

- Corporate 10-year BBB corporate bond spread widens to 590bps as economic growth slows. Equity prices decline by -62% as corporate profits wane, the equity volatility index peaks at 60.
- Corporations defer hiring, placing further downward pressure on the economy.
- National home prices decline by -30% with commercial real estate declining by -40%. The California economy performs worse than the national level, state level HPI declines by -43% and state level commercial real estate prices decline by -46%.
- The 2nd half of the stress horizon features a flat interest rate profile, with yields on the 10-year Treasury note hovering at 4% through the end of the 9Q stress horizon.
- Oil prices experience a sharp decline, falling -48% from spot levels.

Key Macro Economic Variables for the Internal Severely Adverse Scenario

- **GDP:** GDP declines by -7.5% and remains weak throughout much of the stress horizon
- **U.S. unemployment rate:** The unemployment rate climbs to 10.6%
- **Short-term rates:** 3-month Treasury rate declines to 8bps and remains constant throughout the severe recession
- **Long-term rates:** The yield on 10-year Treasuries ticks higher in the first half of the recession as foreign buyers shun longer dated issuance, yields then remain flat for the 2nd half of the stress window
- **Corporate spread:** The spread on 10-year corporate bonds widens to 590bps
- **Equity markets:** The S&P 500 declines by -62%; equity volatility increases to 60
- **Real estate prices:** The Core Logic HPI declines by -30% & Commercial Real Estate Prices drop -40%; State (California) residential and commercial prices are hard hit, declining by -43% & -46% respectively
- **Energy price:** Spot oil prices decline by -48%